Tx Announcement

Patent Application

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Date
January 23, 2006

Acronyms
Tx..... Transmission
MAC..... Medium Access Control
PHY..... Physical Layer
ZLF..... Zero Length Frame
HT..... High Throughput
TxA..... Tx Announcement

Invention
The Tx Announcement is an indication inside a frame which is addressed to a certain destination, that another transmission for that same destination will follow. The indicated transmission does not need to include a MAC destination address, because the Tx Announcement indication was set on the preceding transmission to that station.

The transmission indicated by the Tx Announcement could be a PHY header without MAC portion, which is also called a zero-length frame or ZLF. A ZLF could be transmitted for the purpose of sounding the channel between a sender and a responder.

The transmission indicated by the Tx Announcement may start after the receiver sent a possible response frame to the frame with the Tx Announcement. The indicated transmission may start after SIFS, but there is no strict requirement on the timing. However, if the interval is longer than SIFS (or PIFS), there is a risc that a transmission from another node will gets interspersed, in which case this frame then falsely gets interpreted as the indicated transmission.

The Tx Announcement could be a bit inside a MAC header field, such as the HT-Control field.

Tx Announcement is illustrated in Figure 1 and Figure 3.

UBIQUITI 1005

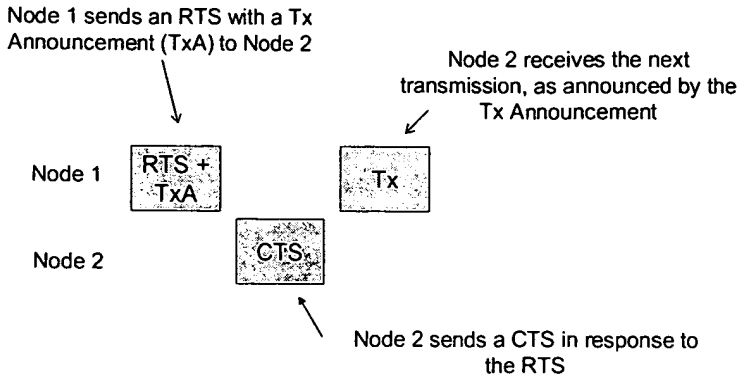


Figure 1. Illustration of Tx Announcement. The RTS with the Tx Announcement is followed by the mandatory CTS response, after which the announced transmission follows.

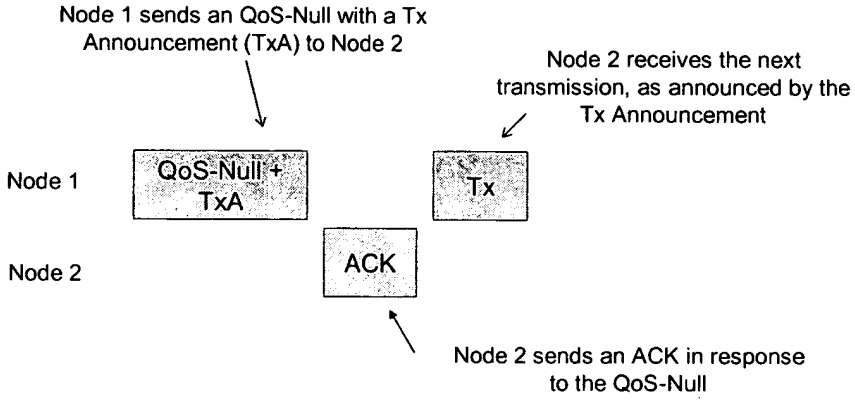


Figure 2. Illustration of Tx Announcement. The QoS-Null with the Tx Announcement is followed by the mandatory ACK response, after which the announced transmission follows.

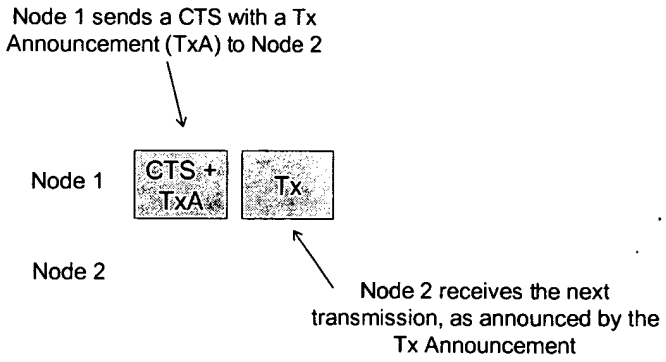


Figure 3. Illustration of Tx Announcement. The announced transmission follows after the CTS, because there is no response frame to a CTS.

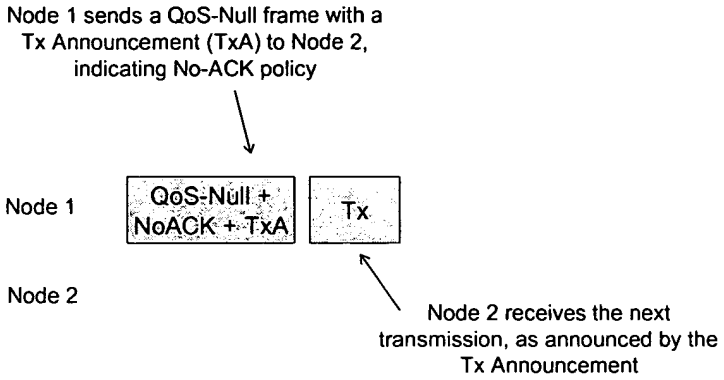


Figure 4. Illustration of Tx Announcement. The announced transmission follows after the QoS-Null, because there is no response frame to a frame with No-ACK policy.

Besides these examples, a Tx Announcement could be present in other frames as wel, such as Data frames, Null frames, Management frames, Control frames, QoS frames, etc. A mandatory response may be interspersed between the frame carrying the Tx Announcement and the announced transmission. The announced transmission itself may or may not provoke an acknowledgement, but generally would not do so.

The Tx Announcement has been included in the EWC specification and the 802.11n draft standard, to announce the arrival of a ZLF sounding frame. The announcement bit is located at bit 24 of the HT Control field, as illustrated in Figure 5 and Figure 6. This illustration is copied from EWC MAC spec v124, which is the version which was confirmed as the first 802.11n draft in Kona, January 2006.

	B0-B15	B16-17	B18-19	B20-21	B22-23	**B24**	B25-29	B30	B31
	Link Adaptation Control	Calibration Position	Calibration Sequence	Feedback request	CSI/ Steering	**ZLF Announcement**	Reserved	AC Constraint	RDG/More PPDU
# Bits	16	2	2	2	2	1	5	1	1

Figure 5. HT Control field with ZLF announcement bit.

Field	**Meaning**	**Definition**
ZLF Announcement	The ZLF Announcement indicates that a ZLF will be transmitted after the frame (according to the rules described in section 6.18).	0 – no ZLF will follow 1 – ZLF will follow

Figure 6. Meaning of the ZLF Announcement bit inside the HT Control field.

The concept of ZLF Annoucement was proposed by undersigned in an email to the EWC technical reflector on December 21, 2005:

Date: Wed 12/21/2005 09:35
From: Menzo Wentink
To: 'Matthew Fischer'; Peter Loc; Jason Trachewsky; Kasher, Assaf; ewc-technical@enhancedwirelessconsortium.org
Subject: RE: [ewc-technical] Zero length Packet

There could be an issue with this: If the receiver has to expect a possible ZLF after every frame it receives with a matching RA, this may imply quite some overhead -- i.e. running a timer after every received frame, etc.

Better would be to create a special announcement frame, which precedes the ZLF. Call it ZLF Announcement. For instance a QoS-Null with HT Control field, where bit 24 of the HT Control field is used to indicate that this is a ZLF Announcement (bit 24 is currently reserved). The ZLF follows within SIFS for no-ACK, or SIFS after the ACK for immediate-ACK. Not sure if this would have to be limited to QoS-Null, because HTC could also be part of QoS Data, but we can argue about that later. Another option is a management action frame, but this would limit our choices because management frames do not have the no-ACK option.

Menzo

-----Original Message-----
From: Matthew Fischer [mailto:mfischer@broadcom.com]
Sent: Wednesday, December 21, 2005 08:06
To: Peter Loc; Jason Trachewsky; Kasher, Assaf; ewc-technical@enhancedwirelessconsortium.org
Subject: RE: [ewc-technical] Zero length Packet

Peter,

Even if an immediate MAC ACK response were generated, that response still does not tell the transmitter when the feedback is coming.

--- Matthew Fischer ---
Nice Guy
408 543 3370
mfischer@broadcom.com

> -----Original Message-----
> From: Peter Loc [mailto:ploc@marvell.com]
> Sent: Tuesday, December 20, 2005 6:20 PM
> To: Jason Trachewsky; Kasher, Assaf;
> ewc-technical@enhancedwirelessconsortium.org
> Subject: RE: [ewc-technical] Zero length Packet
>
> Hi Jason,
>
> The question in my mind is how long should the tx wait before it sends
> another data packet followed by the ZLF to request sounding data again
> from the receiver? How does the tx know that the rx has correctly
> received the sounding request and is in the process of sending the
> feedback to the tx?
>
>
> Best Regards,

> Peter Loc
>
>
>
> -----Original Message-----
> From: Jason Trachewsky [mailto:jat@broadcom.com]
> Sent: Tuesday, December 20, 2005 6:02 PM
> To: Peter Loc; Kasher, Assaf;
> ewc-technical@enhancedwirelessconsortium.org
> Subject: RE: [ewc-technical] Zero length Packet
>
> Hi, Peter.
>
> I'm not sure I see the problem with this case. The sounding frame is
> lost. No feedback is returned. And, the tx may simply sound the
> channel again.
>
> I don't see the need for tight coupling.
>
> Best regards,
>
> Jason
>
> -----Original Message-----
> From: Peter Loc [mailto:ploc@marvell.com]
> Sent: Tue Dec 20 17:53:22 2005
> To: Kasher, Assaf; ewc-technical@enhancedwirelessconsortium.org
> Subject: RE: [ewc-technical] Zero length Packet
>
> Hi Assaf,
>
> The statement does help in resolving the issue associated with the
> "mistaken TA" that I have brought up in my previous email. However, I
> still have a concern regarding the transmitter that it has no way of
> knowing that the intended RA has received both the preceding and
> sounding packets since there is no ACK mechanism employed. If the
> intended RA does not receiver both packets correctly, it will discard
> the sounding (zero length) packet and will not perform the sounding
> request. Meanwhile, the transmitter is waiting for the feedback from
> the receiver.
>
>
>
> One solution is to require the receiver to send an ACK within SIFS if
> it can not respond to the sounding request within SIFS.
>
>
>
> Best Regards,
>
> Peter
>
>
>
> _____
>
> From: Kasher, Assaf [mailto:assaf.kasher@intel.com]

> Sent: Tuesday, December 20, 2005 1:09 PM
> To: ewc-technical@enhancedwirelessconsortium.org
> Subject: [ewc-technical] Zero length Packet
>
>
>
> Hi All,
>
> The following text, when added to chapter 9 in the EWC PHY spec, can
> be used to describe a zero length packet.
>
>
>
> An STA may sound the channel using a zero length packet (indicated by
> zero in the HT-Length field in the HT-SIG) with the sounding bit set.
> The number of LTF's is the number implied by the MCS. An STA shall
> process a zero length packet if the previously received packet
(within
> SIFS) has the same RA of the STA. No HT-DATA field follows the
> HT-LTF's. A zero length packet, may be discarded by any other STA.
A
> packet requiring any type of immediate ACK shall not be transmitted
> immediately preceding a zero length packet.
>
>
>
> If this text is acceptable, we may remove the non staggered sounding
> packet format and remain with a single sounding packet format. If
> this satisfies everybody, it may (IMHO) increase our chances of
> getting the required majority in the JP.
>
>
>
> I'd you all to comment on this text and the zero length sounding
> packet idea.
>
>
>
> BR,
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>
>
> Assaf
>
>
>
> Assaf Kasher
>
> WLAN PHY architect
>
> Intel MG/WNG/WFEi
>
> Office +972-4-8651547
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> Cell +972-54-7885647
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I claim:

1. A wireless local area network comprising: a Tx Announcement inside a frame and addressed to a certain destination, indicating that another transmission for said destination will follow, wherein said transmission optionally relies on a preceding transmission to said destination.